N° 21,320 A.D. 1910

(*Under International Convention.*)

Date claimed for Patent under Patents and Designs Act, 1907, being date of first Foreign Application (in Germany), } *13th Sept., 1909*

Date of Application (in the United Kingdom), 13th Sept., 1910

At the expiration of twelve months from the date of the first Foreign Application, the provision of Section 91 (3) (a) of the Patents and Designs Act, 1907, as to inspection of Specification, became operative

Accepted, 29th June, 1911

COMPLETE SPECIFICATION.

A New or Improved Propeller.

I, GEORG PINKERT, of 36, Ferdinandstrasse, Hamburg, in the German Empire, Civil Engineer, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to that known type of propeller for water and air-ships or vehicles of all kinds in which are employed vanes, blades, paddles or flanges extending radially from a rotating body such as a shaft or boss for example, such radial vanes and the like lying parallel to the axis of rotation and used in connection with means, such as an enclosing casing for example, for converting the centrifugal force generated by the rotation of these radial vanes or the like, wholly or partly into pressure acting in the direction of motion of the ship or vehicle.

According to the generally current physical fundamental laws, surfaces extending radially from a rotating body, such as a shaft for example, act only centrifugally when the body rotates if the radial surfaces lie exactly in the direction of the axis, that is to say parallel to the latter.

The object of the propeller forming the subject-matter of the present invention is to provide improved means for converting the centrifugal action of the rotating surfaces or blades of such propellers more or less completely into suction and pressure action in a direction parallel to the shaft.

I attain this object by the combined action of a freely rotating unenclosed conical or pyramidal surface and a large number of radial surfaces, or blades which extend from the point of the said cone to its base, rise from the conical surface, but do not extend at any point beyond the circumference of the base of the cone or forward beyond the front end thereof. In order to obtain a good effect in this arrangement it is immaterial whether the surfaces or blades are arranged on the outer or inner surface of the cone, or on both surfaces. If the surfaces or blades are arranged on the inner surface of the cone the latter must

[*Price 8d.*]

obviously be made hollow, and have a sufficiently large opening at the point for the entrance of the surrounding medium.

In the accompanying two sheets of drawings are shewn, by way of examples, several methods of carrying out the invention:—

Figure 1 shews a side view of a cone propeller with blades on the outside.

Figure 2 shews a front view of same, whilst

Figure 3 shews the same propeller in vertical longitudinal section taken on the line A—B of Figure 2.

Figure 4 shews a side view of this propeller with the blades on the outside placed at an angle to the direction of the shaft.

Figure 5 is a front view of same.

Figure 6 shews the propeller in accordance with Figures 1 to 3 in longitudinal section taken on the line A—B of Figure 2 with a closing cap.

Figure 7 is a double propeller in accordance with Figures 1 to 3 for forward and backward movement in longitudinal section taken on the line A—B of Figure 2.

Figures 8 to 10 shew various examples of shapes of blades that may be employed.

Figure 11 shews a side view of a propeller with outside blades, the body of which forms a polygonal pyramid.

Figure 12 is a front view of same, and

Figure 13 is a longitudinal section of same taken on the line C—D of Figure 12.

Figure 14 shews a side view of a cone-propeller with outside and inside blades.

Figure 15 is a rear view of the same propeller, and

Figure 16 is a longitudinal section of same taken on the line E—F of Figure 15.

Figure 17 is a side view of a cone-propeller with blades on the inside only.

Figure 18 is a rear view of the same, and

Figure 19 a longitudinal section of the same taken on the line G—H of Figure 18.

The cone-propeller shewn in Figures 1 to 3 is to be regarded as the typical fundamental form of the new propeller system.

The hollow conical body *k* is formed at its point *s* with a boss *n*, by means of which the cone is fixed upon the shaft *w* in any suitable way. In the drawing is shewn, merely by way of example, the method usually employed for fixing ordinary screw-propellers by means of a washer *u* and a nut *m*.

On the outer surface of the cone *k* are fixed a convenient number of outer blades *a* in such a manner that they radiate, at exactly equal distances apart, from the point *s* of the cone to the base *p* thereof; the longitudinal direction of the blades *a* agreeing with the direction of the shaft, that is to say the surfaces of all the blades stand exactly parallel to the direction of travel.

The conical body *k* may be cast in one piece with its boss *n*, and the blades *a* may be made of steel plate, wood or the like, and be fixed to the conical body *k* by means of rivets or screws. For large propellers, however, the conical body *k* is preferably made of thick boiler plate fixed in any suitable way to the boss *n* at the point of the cone.

The number of blades *a* is to be determined according to their shape and breadth of surface. In Figure 2 are arranged sixteen blades *a*, which number practical experiment has shewn to be the best with the shape of blade shewn in Figure 1, but with this form of blade between two and thirty-six blades *a* may be employed. When few blades are employed the surface of each blade *a* must be larger, with a larger number of blades correspondingly smaller surfaces are employed. The rear edges *h* of the blades must not in any case extend beyond the circumference of the base *p* of the cone, because an extension of the edges of the blades beyond the periphery *p* would immediately produce prejudicial centrifugal action, and for the same reason the blades *a* must not extend forward beyond the front end of the cone *k*.

In the arrangement shewn in Figures 4 and 5 the blades *a* are not fixed radially to the conical body *k*, as in Figure 2, but eccentrically or tangentially thereto, so that the surfaces of the blades stand at a slight angle to the direction of the shaft.

The propeller shewn in Figures 11 to 13 differs only from that shewn in Figures 1 to 3 in that instead of the round cone a suitable polygonal pyramid *b* serves as base for the outer blades *a*. These outer blades *a* are in this case fixed at the corners or angles of the pyramid *b*, and their number corresponds to that of the said corners or angles. In the drawing are shewn sixteen corners or angles with sixteen blades *a*, but the number may be varied between four and thirty-six.

Figures 14 to 16 shew the employment of both outer and inner blades on one cone-propeller. The point *s* of the conical body *k* is cut off from the conical body so that a correspondingly large inlet opening *e* is produced; the body *k* is connected rigidly with the boss *n* by means of front and rear arms *o*.

The outer blades *a* are fixed radially on the outer surface, and the inner blades *i* on the inner surface of the conical body *k* at uniform distances from one another; in this case also the rear edges *h* of the outer blades *a* must not extend beyond the periphery *p* of the base of the cone, and the rear edges *h* of the inner blades *i* must not stand beyond the rear edge of the base *p*, in order to avoid prejudicial centrifugal action. The blades *a* and *i* are, in this case, arranged twelve inside and twelve outside. The blades *a* and *i* may be fixed to the outer and inner surfaces of the conical body *k* exactly opposite one another, but it is preferable to arrange the outer and inner blades alternately, that is to say, to fix the inner blades *i* opposite the spaces between the outer blades *a*.

In Figures 17 to 19 is shewn a propeller with inner blades *i* only. In this case the point *s* of the conical body *k* is likewise cut off, so that a sufficiently large inlet opening *e* is left at the front. The inner blades *i* are fixed to the inner surface of the body *k*, and the latter is connected to the boss *n* by means of the arms *o*.

Figures 8 to 10 shew various shapes of blades, solely by way of examples, without thereby limiting the possible forms to these examples.

The arrangement according to Figure 8 is suitable for propellers for slow moving vessels (freight steamers and the like) in which propellers with few blades and large surface are preferable.

Figure 9 shews an intermediate stage for quick moving vessels, in which blades of the shape shewn in Figures 1 and 10 arranged in greater number are to be preferred.

By practical experiment it is proved that the new propeller yields the most effective suction work in the first two-thirds of the length of the blades beginning from the point *s*, and that the suction action decreases materially therefrom towards the base *p* of the body, so that finally the rear ends *h* of the blades serve more as guide blades. Immediately the outer edges of the blades *a* extend beyond the periphery of the base *p* of the cone prejudicial centrifugal action begins, especially if this extension is present near the base *p* of the cone. In the inner blades *i*, on the contrary, this extension does not interfere with the effective action, even if the inner edges of the blades *i* reach to the boss *n*, as the flow of the medium drawn in (water or air) both outside and inside takes place along the surfaces of the conical body *k*, as shewn by dotted arrow lines *x* in the Figures 3, 16 and 19.

The action of the new propeller will be understood from Figures 3, 16 and 19.

The radially standing blades *a* and *i* on being rapidly rotated seize the medium (water or air) surrounding the propeller, and throw it against the conical surfaces, on which it flows along accelerated as it goes and finally leaves the propeller as a hollow cone as shewn by dotted lines. With high speed of the ship the medium leaves the propeller like a pipe drawn over a mandril.

The propeller always acts in a forward direction only, that is to say in the direction of the point *s* of the cone whichever way the propeller rotates. For

moving backwards propellers must be used which are directed oppositely to those for forward movement.

Such propellers adapted for forward and backward movement are shewn in Figure 7. In this case the cone *k* for forward movement is fixed upon a hollow shaft *w*, and the cone k^1 for backward movement, directed oppositely to the first named, is fixed upon a solid shaft w^1 which passes through the hollow shaft *w*. According as the shaft *w* or w^1 is rotated the cone *k* effects forward motion or the cone k^1 backward motion; the propeller which is stationary for the time being offers no material resistance to the medium (water or air) flowing from the working propeller, but its blades *a* serve rather as guide blades.

The quicker the rotation of the propeller so much greater is the action, and theoretically there is hardly any limit to the increase of action by increase of revolutions.

For propellers in accordance with Figures 1 to 5 it is advisable to close the base *p* of the cone by a conically shaped cap *c* at the rear as shewn in Figure 6.

For all propellers it is advisable to provide the base of the cone with a fly-wheel ring of heavy metal, such as lead for example, but care should be taken that the escape of the medium along to the conical surface is not interfered with.

The explanation of the peculiar action of the new propellers can only be found in the following:—

Rapidly rotating radially placed wing or blade-surfaces can, according to hitherto known natural laws, only act centrifugally. Further, rapidly rotating smooth conical surfaces can, of themselves, yield no kind of action. The actual suction and pressure action in the direction of the axis of the cone produced with the new propellers can therefore only be produced by the combined action of radial and conical surfaces.

The blade surfaces rising on all sides from the point *s* to the base *p* of the cone should also be able to exert without a conical surface, a certain suction and pressure action as the peripheral speed of the blades at the point *s* is much less than that of the periphery *p*. This, however, is not the case, but rather there is produced only an eddying or vortex movement without action in any definite direction.

But by adding the conical or pyramidal surface the increasing peripheral speeds of the radial surfaces *a* from the point *s* to the base *p* are enabled to act by suction. If air for example is taken as the medium, the great peripheral speed of the radial surfaces near the base *p* of the cone tends to throw the air centrifugally outwards; if the air is thrown outwards it must, however, flow from inwards, but the conical surface is inside; the air must, therefore, be taken from where the peripheral speed is less, that is from the point *s*, but there also the radial surfaces already act, which, however, cannot throw outwards the air flowing to them, because the inner requirement of air, of the radial surfaces moving with greater speed, is greater than the requirement of air of the surfaces at the point *s* of the cone moving with less peripheral speed. As the conical surfaces extending out from the point to the base of the cone have a constantly increasing peripheral speed there must be produced a powerful constantly accelerated stream of air along the whole length of the conical surface from the point *s* to the base *p*, which neutralizes all centrifugal action, provided the radial surfaces do not extend materially beyond the largest circumference of the base of the cone. A provision for the most favourable conversion of the centrifugal force into suction and pressure force is that the total of the acting radial surfaces is at least equal to the total conical surface; the radial surfaces may, however, be considerably greater than the conical surface if this excess is distributed near the point of the cone.

I am aware that in one known arrangement of the type of propeller referred to in the opening paragraph of this specification there is an unenclosed cone having radial blades upon its surface, which blades do not extend beyond the front end of the cone, but I would have it understood that an essential difference between

this propeller and that above described is that in the former the blades extend at their rear ends beyond the circumference of the base of the cone, whereas in the latter they do not so extend at any point.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

First. A propeller characterized by a rotating unenclosed conical body (*k*) the conical surface of which is provided with radial surfaces or blades (*a*) extending backward from the point (*s*) of the cone to the base (*p*) thereof, parallel to the direction of the shaft, but not extending at any point beyond the circumference of the said base, or forward beyond the front end of the conical body (*k*).

Second. A propeller characterized by a rotating unenclosed polygonal pyramidal body (*b*) the surfaces of which are provided with radial surfaces or blades (*a*) extending from the point (*s*) of the pyramid to the base (*p*) thereof parallel to the direction of the shaft, but not extending at any point beyond the periphery of the said base, or forward beyond the front end of the pyramidal body (*b*).

Third. A propeller characterized by a rotating unenclosed conical body (*k*) the conical surface of which is provided with radial surfaces or blades (*a*) extending backward from the point (*s*) of the cone to the base (*p*) thereof, the feature of which is that the radial surfaces or blades (*a*) are arranged at an angle or tangentially to the axis of the cone (*k*), but do not extend at any point beyond the circumference of the said base, or forward beyond the front end of the cone (*k*).

Fourth. A propeller in accordance with the first claiming clause hereof, the feature of which is that the cone (*k*) is provided both on its outer and inner surfaces with radial surfaces or blades (*a*) and (*i*) extending from the point (*s*) of the cone to the base (*p*) thereof, parallel to the direction of the shaft, wherein the conical body (*k*) is open in front and is fixed to the boss (*n*) by means of the arms (*o*).

Fifth. A propeller in accordance with the first claiming clause hereof, the feature of which is that the hollow conical body (*k*) provided with an inlet opening (*e*) at the point of the cone has, on its inner surface only, radial surfaces or blades (*i*) extending from the inlet opening (*e*) to the base (*p*) of the cone.

Sixth. A propeller in accordance with the first claiming clause hereof, the feature of which is that the cone (*k*) is closed at its base with a conically shaped cap (*e*).

Dated this 7th day of September, 1910.

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115, Cannon Street, London, E.C.,
Chartered Patent Agents.

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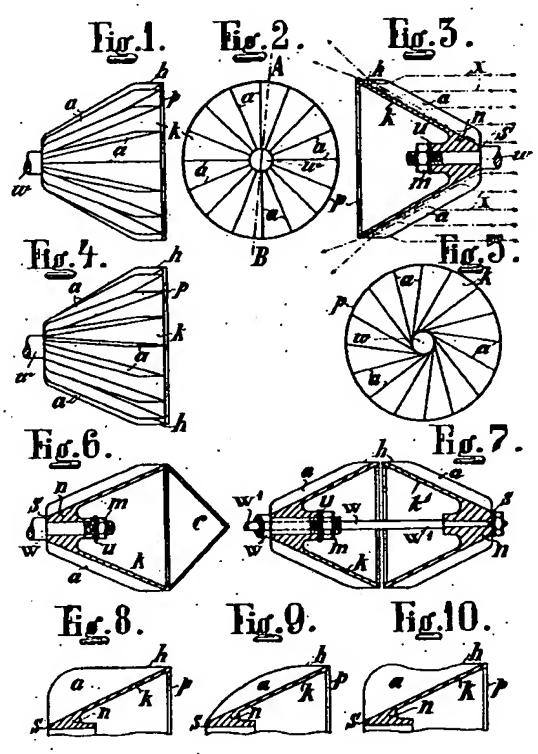
A.D. 1910. Sep. 13. N° 21,930.
PINKERT'S Complete Specification.

(2 SHEETS)

SHEET 1.



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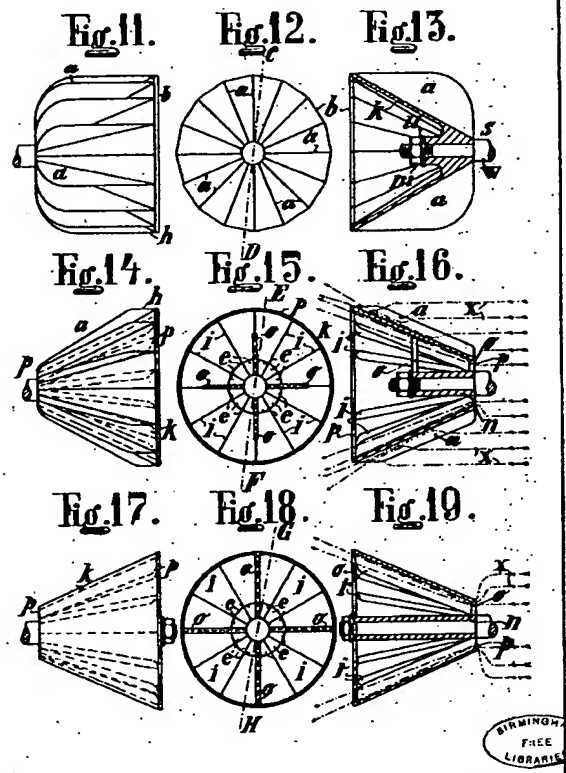


[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

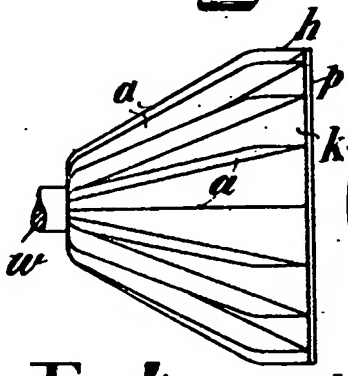


Fig. 2.

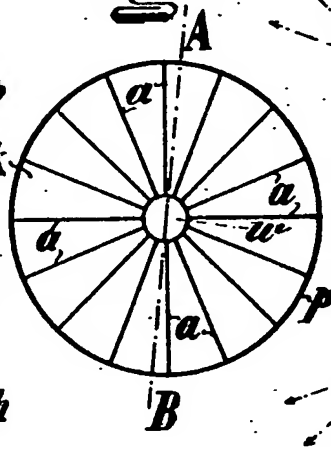


Fig. 3.

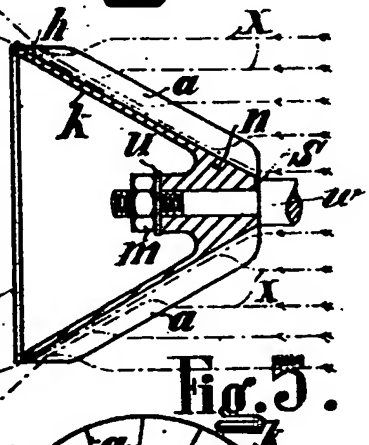


Fig. 4.

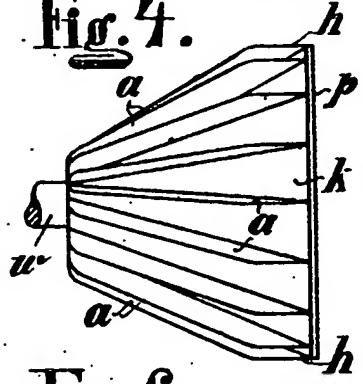


Fig. 5.

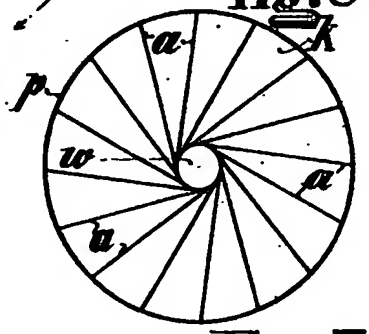


Fig. 6.

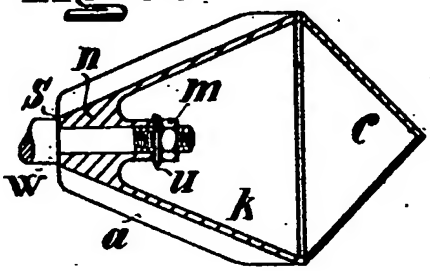


Fig. 7.

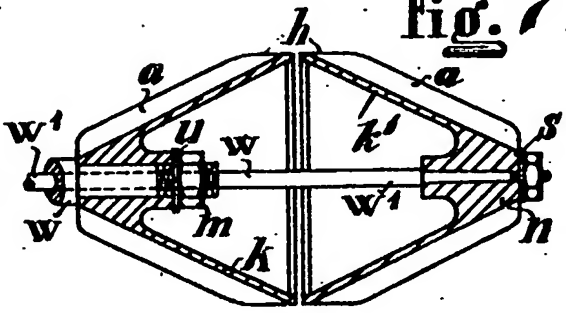


Fig. 8.

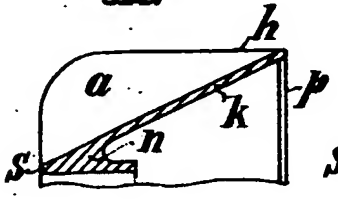


Fig. 9.

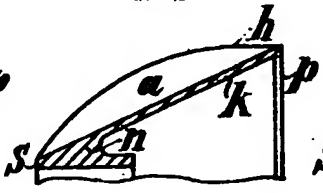


Fig. 10.

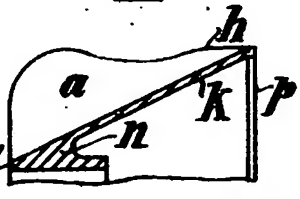


Fig.11.

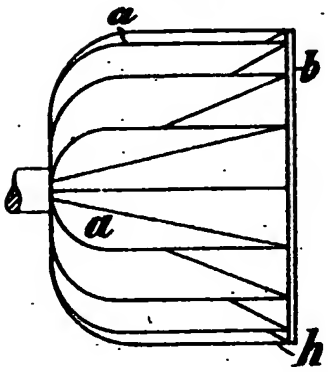
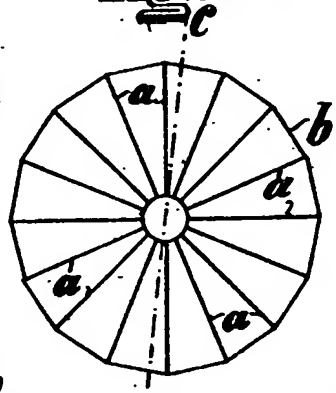


Fig.12.



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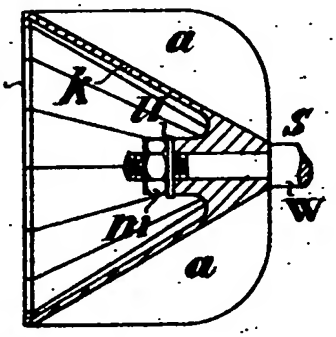


Fig.14.

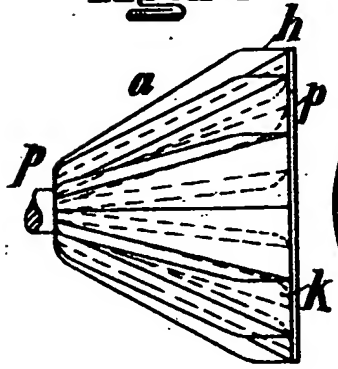


Fig.15.

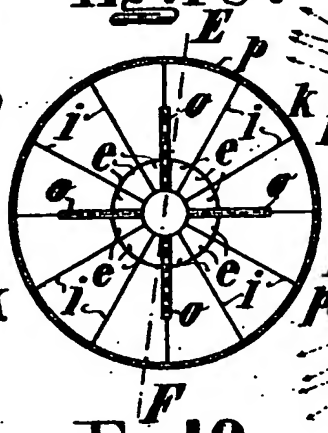


Fig.16.

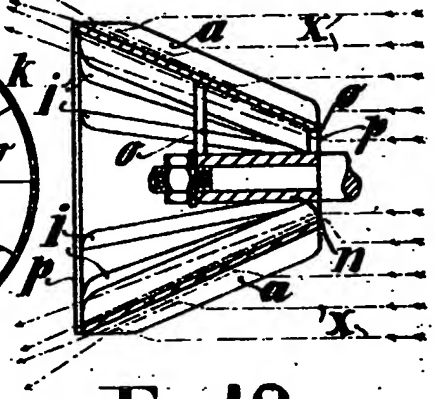


Fig.17.

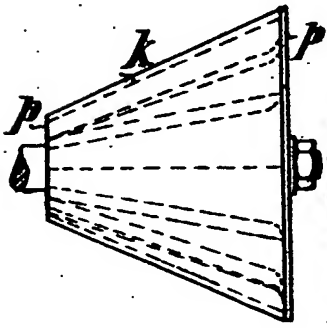


Fig.18.

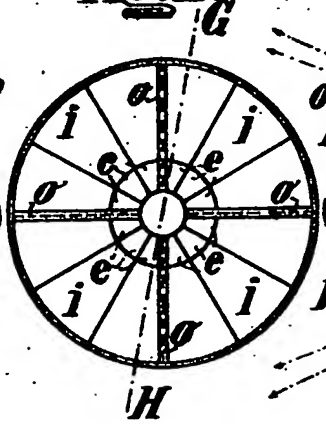
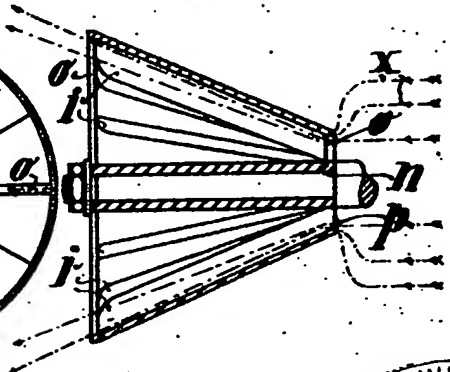


Fig.19.



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